



**ELECTRONIC SINGLE-PHASE
WATT-HOUR METER
WITH DIGITAL COMMUNICATION
LS1.1 TYPE**



USER'S MANUAL



CONTENTS

| | |
|---|-----------|
| 1. APPLICATION..... | 5 |
| 2. BASIC INFORMATION | 5 |
| 3. WATT-HOUR-METER SET | 6 |
| 4. WATT-HOUR METER DESIGN..... | 6 |
| 5. INSTALLATION..... | 7 |
| <i>5.1. External dimensions and fixing way</i> | <i>7</i> |
| <i>5.2. Connection diagrams.....</i> | <i>9</i> |
| 6. DISPLAYED INFORMATION | 10 |
| <i>6.1. View of LCD display.....</i> | <i>10</i> |
| <i>6.2. Displayed energy.....</i> | <i>11</i> |
| <i>6.3. LED pulse output</i> | <i>11</i> |
| <i>6.4. Signalling of phase voltage presence</i> | <i>11</i> |
| <i>6.5. Signalling of the active tariff (time zone).....</i> | <i>11</i> |
| <i>6.6. Signalling of energy counting</i> | <i>11</i> |
| <i>6.7. Signalling of review, parameter programming or interference with a magnetic field</i> | <i>11</i> |
| <i>6.8. Signalling of housing opening (interference in the watt-hour meter)</i> | <i>12</i> |
| <i>6.9. Signalling of extra information</i> | <i>12</i> |
| 7. CHANGE OF WATT-HOUR METER CONFIGURATION..... | 12 |
| <i>7.1. Button</i> | <i>12</i> |
| <i>7.2. Way of configuration parameter change.....</i> | <i>13</i> |
| 8. ENERGY MEASUREMENT | 19 |
| <i>8.1. Recording of energy in tariffs.....</i> | <i>19</i> |
| <i>8.2. Recording of total energy.....</i> | <i>19</i> |
| 9. POWER REGISTERS | 19 |
| <i>9.1. Averaged maximal power</i> | <i>19</i> |
| <i>9.2. Cumulated power.....</i> | <i>19</i> |
| 10. END OF THE ACCOUNTING PERIOD..... | 19 |
| 11. AVAILABLE TARIFF GROUPS | 20 |
| <i>11.1. Tariff group G11</i> | <i>20</i> |
| <i>11.2. Tariff group G12</i> | <i>20</i> |
| <i>11.3. Tariff group G12w.....</i> | <i>20</i> |
| <i>11.4. Tariff group G13</i> | <i>20</i> |
| <i>11.5. Tariff group C12a</i> | <i>21</i> |
| <i>11.6. Tariff group C12b</i> | <i>21</i> |
| <i>11.7. Tariff group C12w.....</i> | <i>21</i> |
| <i>11.8. Tariff group C22a</i> | <i>22</i> |
| <i>11.9. Tariff group C22b</i> | <i>22</i> |
| <i>11.10. List of holidays</i> | <i>20</i> |

| | |
|---|-----------|
| 12. OPTICAL INTERFACE | 22 |
| 12.1. Watt-hour meter registers in readout mode | 23 |
| 12.2. Watt-hour meter registers in programming and readout mode..... | 26 |
| 13. RS-485 OR RS-232 SERIAL INTERFACE WITH MODBUS PROTOCOL (OPTION)..... | 27 |
| 13.1. List of serial interface parameters..... | 27 |
| 13.2. Map of watt-hour meter registers..... | 28 |
| 14. INTERNAL CONTROL CLOCK (for options with external clock) | 32 |
| 15. TECHNICAL DATA | 32 |
| 16. VERSION CODES..... | 34 |
| 17. MAINTENANCE AND WARRANTY..... | 35 |

1. APPLICATION

LS1.1 electronic watt-hour meters are destined for the direct measurement of active energy in single-phase power networks with the simultaneous display of measured quantities.

They can be applied for settlement of accounts with electric power plants, for industrial process control, for settlement of accounts with sub-hirers.

These watt-hour meters are designed to be mounted on a wall.

The housing enables to set a legalization leaden seal on the watt-hour meter cover and a leaden seal of the energy supplier on the terminal box.

Thanks to built-in communication interfaces, they can be applied as an element of energy management systems.

These watt-hour meters have a 7-digit LCD display with additional graphic symbols. As standard, there is also a lighting and pulsing red diode (LED) and interface for data transmission in infrared.

2. BASIC INFORMATION

LS1.1 electronic watt-hour meters are resistant to a strong external magnetic field, e.g. a neodymium magnet.

A special designed antitheft protection has been applied in the mechanical construction, in the electronic system and in the software.

Protection of the construction

- The frontal cover, having on the whole perimeter, internal and external projections enclosing bilaterally and tightly the base wall, unabling the interference with a tool inside the watt-hour meter.
- The cover is fixed to the base by two screws, what gives a durable junction secured additionally by leaden seals.
- The shield of the terminal box additionally presses down the cover and protects the fixing screws by leaden seals.
- The junction of the cover and the base is sealed, what protects against the infiltration of fluids and dust.

Electronic and programmed protection

- Sensor of mechanical interference in the watt-hour meter. The lift of the watt-hour meter frontal cover causes the sensor operation, and the existed interference is signalled on the display. Additionally, the date and the interference duration are stored in the watt-hour meter memory.
- Sensor of the interaction by a strong magnetic field, e.g. a neodymium magnet. The application of a strong magnetic field to the watt-hour meter causes the sensor operation, and the existed interference is signalled on the display.
- The number of mechanical interference and interactions by a magnetic field is durably recorded in the watt-hour meter.

Protection against the switching of power network wires

The watt-hour meter counts the energy when interchanging network wires. The energy is accounted regardless of the flow direction. The shield of the terminal box can be optionally made of a transparent plastics enabling a visual inspection of the electrical connection correctness with the user (energy receiver).

The watt-hour meter equipment with a communication interface or a radio transmitter gives the possibility of a permanent monitoring, data archiving, visualization and report.

The LS1.1 watt-hour meter can be included into existing computer networks, what is rendered possible by offered interface and protocol converters produced by LUMEL.

3. WATT-HOUR METER SET

The set of the watt-hour meter is composed of:

- | | |
|-------------------------|------|
| - LS1.1 watt-hour meter | 1 pc |
| - User's manual | 1 pc |
| - Warranty card | 1 pc |

4. WATT-HOUR METER DESIGN

The construction of the LS1.1 watt-hour meter is presented on the fig. 1.

The watt-hour meter housing is made of an insulated material (lexan) and ensures the service safety in the protection class II.

The review and setting of watt-hour meter parameters are realized by the button (4) situated in the shield (8). The button is adapted to be sealed with lead. After sealing the button, there is possible to review selected data on the display.

The function of parameter setting is accessible after removing the leaden seal and turning the button.

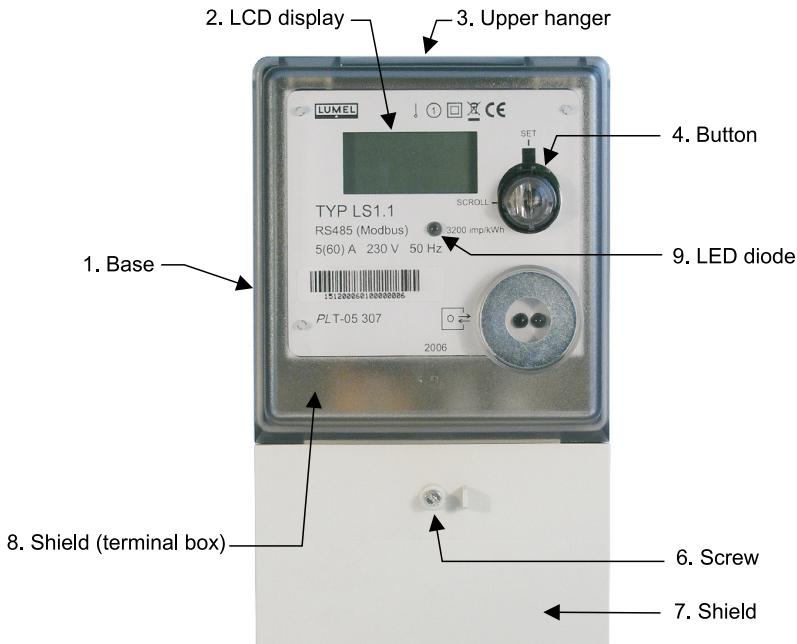


Fig. 1a Watt-hour meter design - view of the watt-hour meter with the fixed terminal box shield (7)

1. Base
2. 7-digit liquid crystal display (LCD) with graphical symbols
3. Upper hanger - metallic element fixing the watt-hour meter to the power box or the watt-hour meter niche
4. Two-function button - review and setting of watt-hour meter parameters
5. Optical link - enables the readout and write of data from and to the watt-hour meter
6. Screw - fixes the shield (7) and is adapted to seal with lead by the power plant
7. Shield of the terminal box
8. Shield of the watt-hour meter - It is fixed to the base by internal catches and two screws (10)
9. LED diode - generates light pulses with a defined time-constant (imp/kWh)

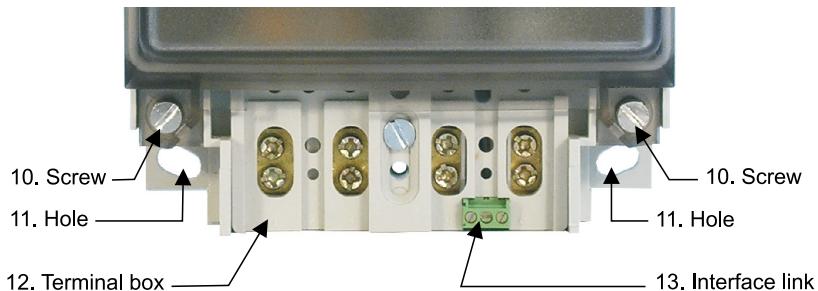


Fig. 1b Watt-hour meter design - View of terminals after removing the terminal shield (7)

10. Fixing screws - to fix the shield (8), they are adapted to seal with lead by the producer or to put the verification mark
11. Fixing holes - with the metallic upper hanger (3), they define the fixing points of the watt-hour meter in the power box (cabinet) or the niche for watt-hour meters
12. Terminal box - enables the connection of measuring circuits
13. Interface link - to connect interface wires

5. INSTALLATION

5.1 External dimensions and fixing way

Watt-hour meter overall dimensions are presented on the fig. 2.

The LS1.1 watt-hour meter is fixed on the wall.

Housing dimensions: 206 x 120 x 65 mm. The box has screw terminals with 6.5 mm internal diameter to connect to the power network, and auxiliary circuits with a wire up to 1.5 mm² cross-section.

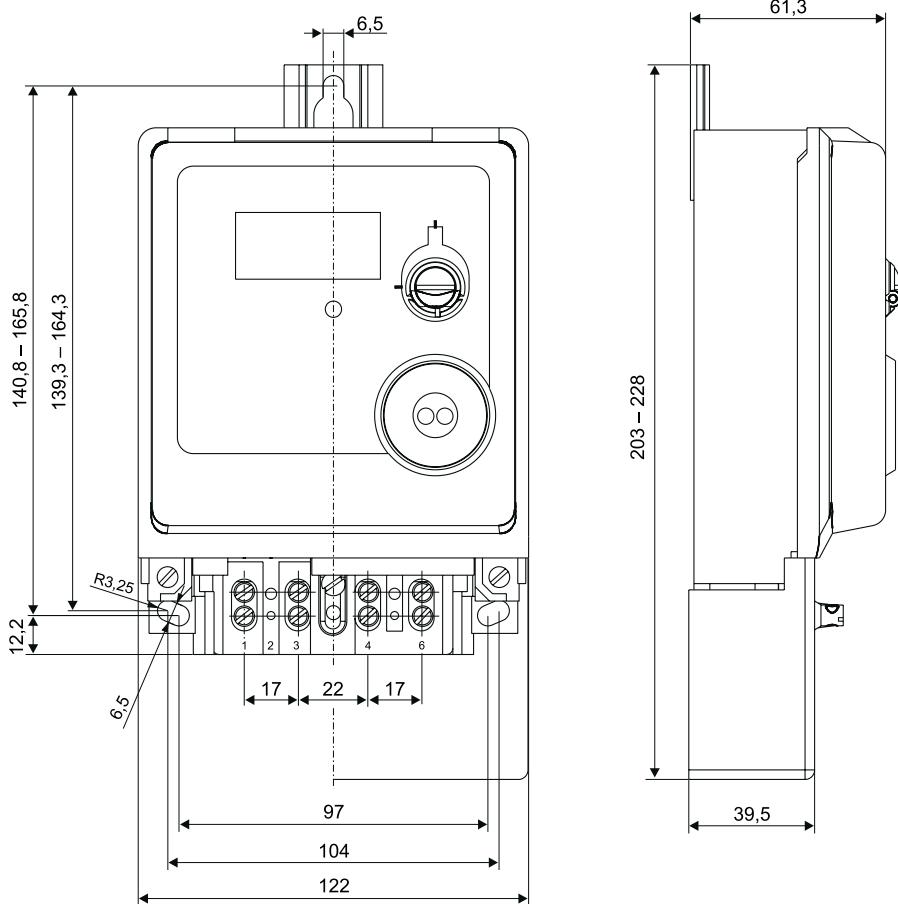
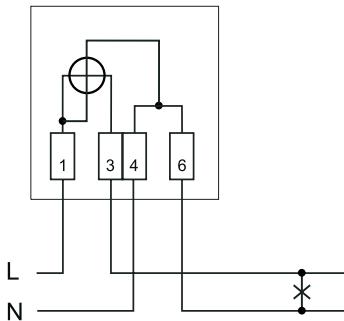
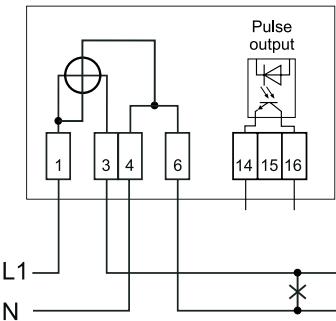


Fig. 2 Watt-hour meter overall dimensions

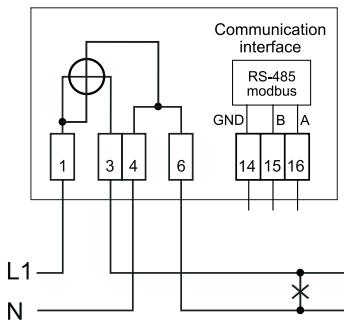
5.2 Connection diagrams



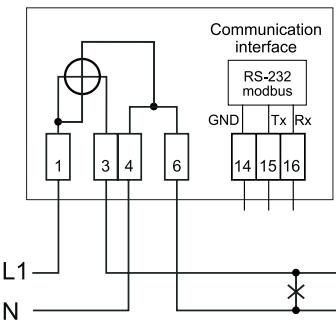
Single-tariff watt-hour meter for direct connection



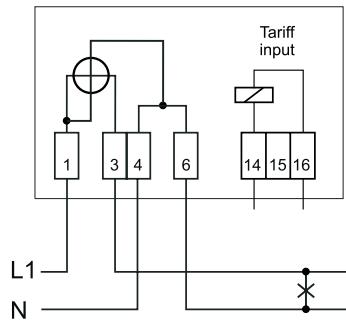
Watt-hour meter with pulse output



Watt-hour meter with an RS-485 communication interface and Modbus protocol



Watt-hour meter with an RS-232 communication interface and Modbus protocol



Two-tariff watt-hour meter with an external clock

Fig.3 External connection diagrams of the watt-hour meter

6. DISPLAYED INFORMATION

It is possible to readout following information on the LCD display:

- ○ Energy in the current zone,
 - ↓ Current time (in the hour:minute format),
 - ↓ Current date (in the year.month.day format),
 - ↓ Energy in zone T1,
 - ↓ Energy in zone T2 (if occurs in the set tariff group),
 - ↓ Energy in zone T3 (if occurs in the set tariff group),
 - ↓ Energy in zone T4 (if occurs in the set tariff group),
 - ↓ Total energy,
 - ↓ Closing time of the accounting period (in the hour:minute format),
 - ↓ Closing date of the accounting period (in the year.month.day format),
 - ↓ Energy in zone T1 at the end of the previous accounting period,
 - ↓ Energy in zone T2 at the end of the previous accounting period (if occurs in the set tariff group),
 - ↓ Energy in zone T3 at the end of the previous accounting period (if occurs in the set tariff group),
 - ↓ Energy in zone T4 at the end of the previous accounting period (if occurs in the set tariff group),
 - ↓ Total energy at the end of the previous accounting period,
 - ↓ Symbol of the set tariff group.

The start of information review, i.e. the transition from the energy display mode in the current zone, follows after pressing the button in the SCROLL position.

Successive information are sequentially accessible. After 30 seconds since the last button pressure, the watt-hour meter returns to the normal working mode. Depending on the option and watt-hour meter configuration, the number of accessible information in the review mode can be smaller

6.1 VIEW OF THE LCD DISPLAY

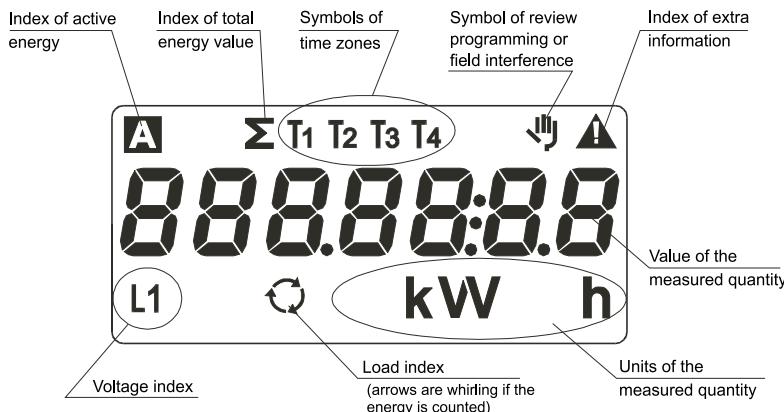


Fig. 4 LCD display

6.2 Displayed energy

In the LS1.1 watt-hour meter, the energy is displayed in kWh, with one decimal place. The counter register has 7 digits.

6.3 LED pulse output

The red lighting LED diode is the index of the energy flow.

The frequency of light flashes is proportional to the current energy flow.

6.4. Signalling of the phase voltage presence



Fig. 5 Index of the phase voltage presence

The L1 index signals the presence of the phase voltage I_n case when its value exceeds 0.9 U_n

6.5 Signalling of the active time zone (tariffs)



Fig. 6 Tariff indexes

The active tariff zone is indicated by one of the symbols, e.g. for the first tariff the T1 symbol is displayed. For the total energy, all accessible tariff symbols together with the Σ sum mark are displayed.

6.6 Signalling of energy accounting



Fig. 7 Index of energy accounting

For signalling the energy accounting, an index composed of 3 arrows is accessible. If the energy is accounted, two arrows are shifting, giving the effect of the index turning round. If the watt-hour meter does not account the energy, all the 3 arrows are visible (they do not turn round). The index turning round speed is constant and does not depend on the measured energy.

6.7 Signalling of review and parameter programming or interference by a magnetic field.



Fig. 8 Index of parametr review programming or field interference

When the user reviews parameters in the SCROLL mode or enters in the SET programming mode, the symbol presented on the fig.8 is visible on the display.

The flickering symbol signals a strong magnetic field interference. If the watt-hour meter is under the influence of this field, then the index is lighting in a permanent way. If the magnetic field duration was longer than 30 seconds and the watt-hour meter is not under its influence, the index flickers till the time of erasing register of interference by the magnetic field through the optical link.

6.8 Signalling of housing opening (interference inside the watt-hour meter)

The lift of the frontal cover (interference inside the watt-hour meter) is signalled on the display by the flickering inscription „OPEN” alternatively with the current readout. In the same time, the date and the interference duration are recorded in the watt-hour meter memory.



Fig. 9 Screen signalling the housing opening

6.9 Signalling of additional information



Fig. 10 Index of additional information

The visible signal above on the display signals that the write through the optical link is allowed. However, the flickering symbol signals the incorrect work of the watt-hour meter.

7 CHANGE OF WATT-HOUR METER CONFIGURATION

The change of watt-hour meter configuration is possible in the programming mode (SET). The watt-hour meter is switched in the SET mode by means of the button.

7.1 Button

The watt-hour meter has one button. By means of this button set on the scroll position in the normal watt-hour meter operation, it is possible to review parameters described in the point 6.

In this position, the button can be leaden sealed. To transit to the SET position, one must remove the seal if exists and turn the button of 90° to the right. The table 1 presents the button functions.

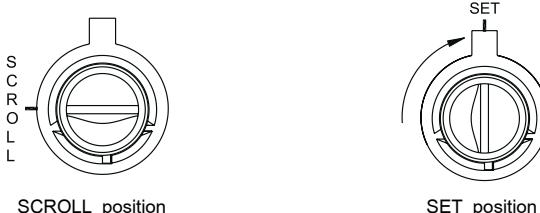


Fig. 11 Available button positions

| Button | Working mode | Function |
|-------------------|--------------|---|
| SCROLL | REVIEW | Review of parameters |
| SCROLL | PROGRAMMING | Selection and change of programmable parameter values |
| SCROLL (> 2 sec.) | PROGRAMMING | Automatic incrementation of the parameter value |
| SET (> 2 sec.) | REVIEW | Entry into the parameter configuration mode |
| SET | PROGRAMMING | Selection of the parameter |
| SET (> 2 sec.) | PROGRAMMING | Acceptation of the parameter group change |

The watt-hour meter transits from the parameter review mode, or from the configuration mode to the normal operation mode after 30 sec. from the last button use.

7.2. Service algorithm

The scheme of the main menu of the watt-hour meter configuration is presented on the fig. 10a. After pressing and hold down the button during at least 2 sec., in the SET position, it is possible to program parameters. The transition between parameters is made by means of the button on the SET position. The table 2 comprises the parameter description. The return to the normal operation follows after reviewing of all visible groups of parameters or automatically, after the laps of 30 sec. since the last button pressing.

Caution: same parameters or parameter settings can be invisible (inaccessible) depending on the watt-hour meter version and its current configuration.

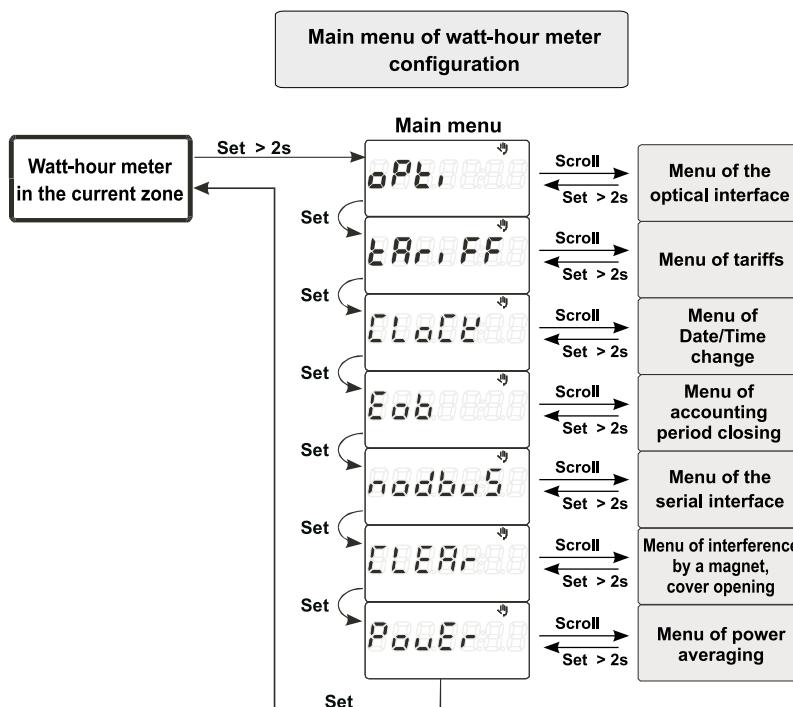


Fig. 12a Watt-hour work algorithm - Main menu

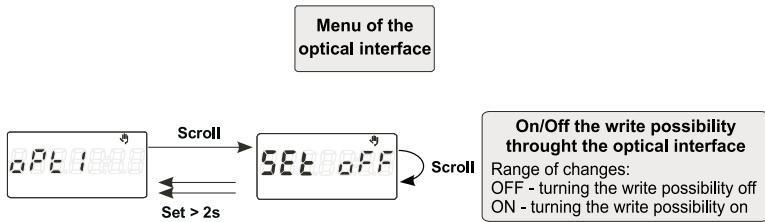


Fig. 12b Algorithm of the watt-hour meter work - menu of the optical interface.

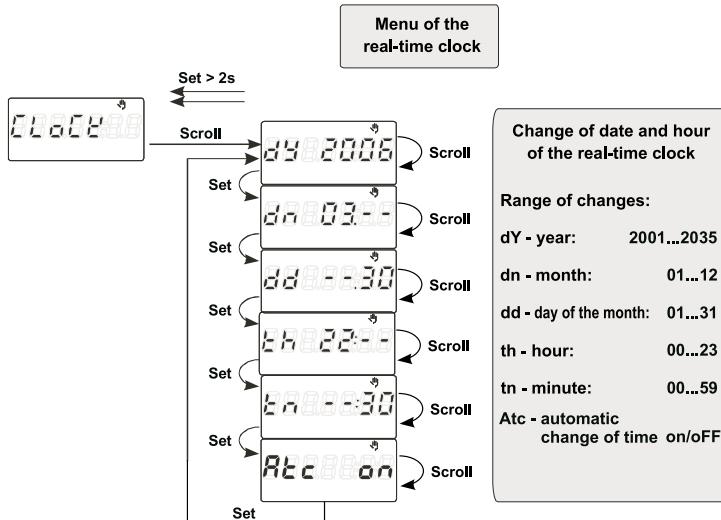


Fig. 12c Algorithm of the watt-hour meter work - menu of the real-time clock

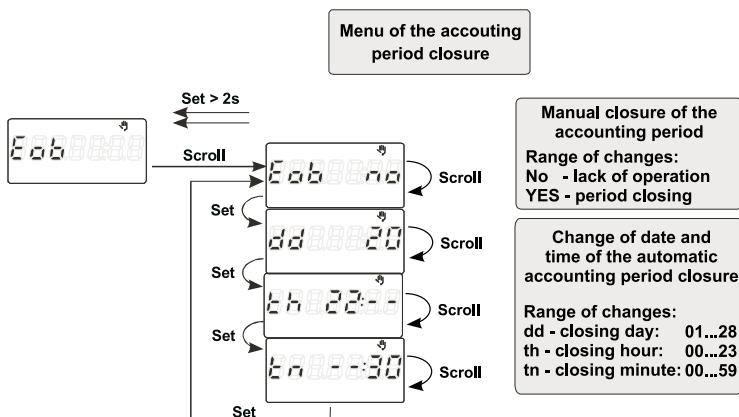


Fig. 12d Algorithm of the watt-hour meter work - menu of the accounting period closure

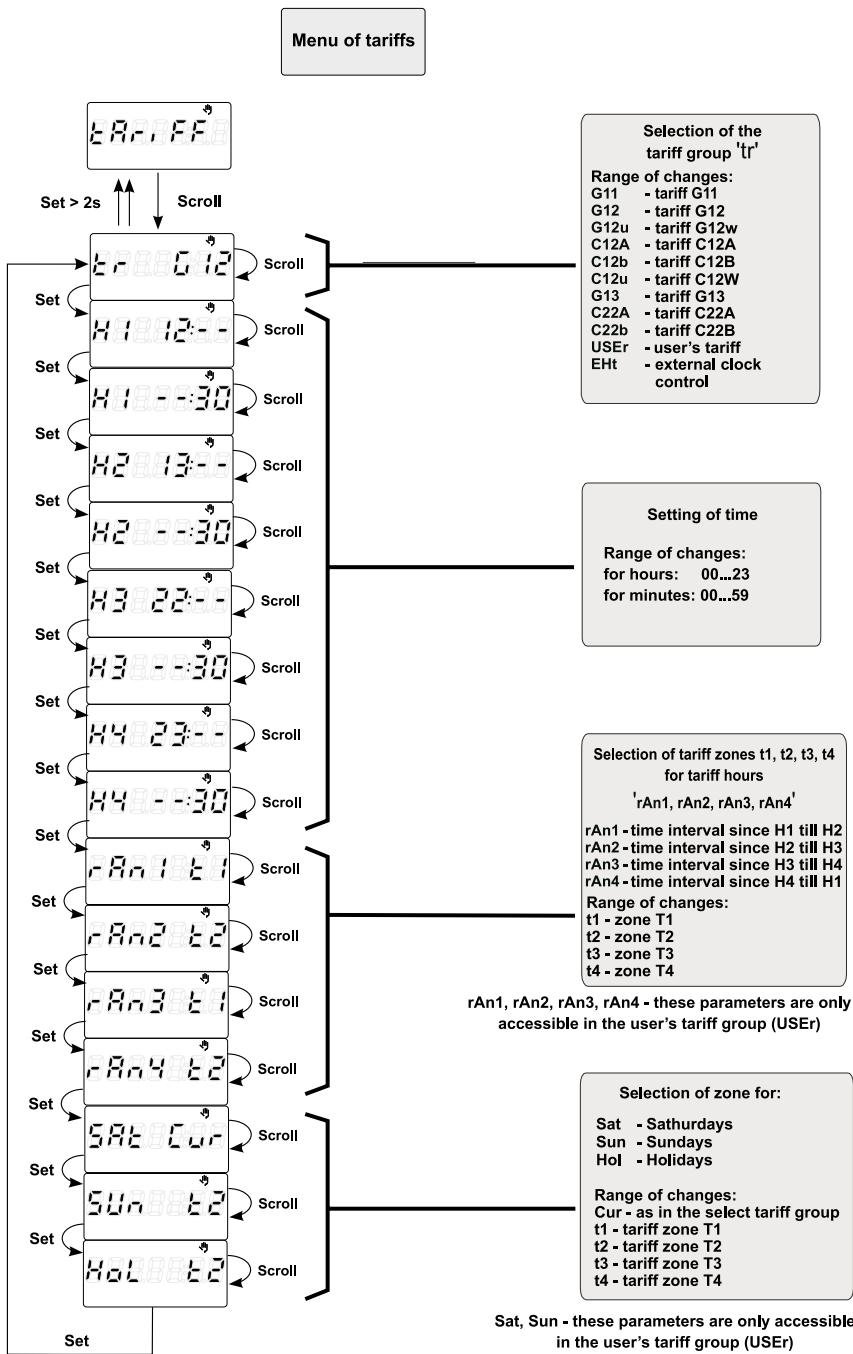


Fig. 12e Algorithm of the watt-hour meter work - menu of tariffs

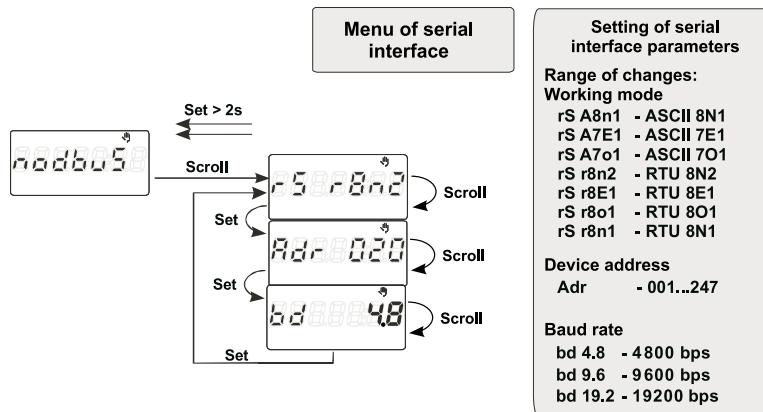


Fig. 12f Algorithm of the watt-hour meter work - menu of serial interface

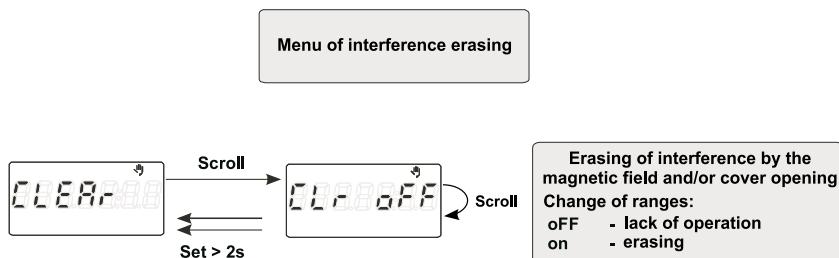


Fig. 12g Algorithm of the watt-hour meter work - menu of interference by a magnet and cover opening

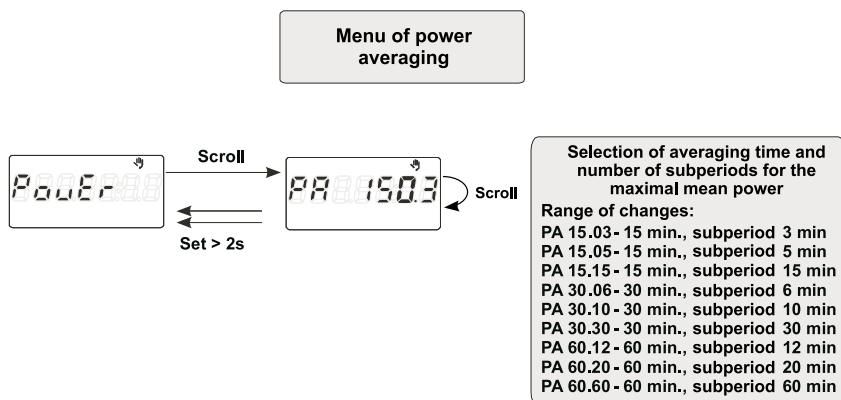


Fig. 12h Algorithm of watt-hour meter work - menu of power averaging

List of configuration parameters

Table 2

| Main menu | Parameter symbol | Parameter description | Range of parametr changes |
|----------------|------------------|---|--|
| <i>oPt</i> | <i>Set</i> | Possibility of write through the optical interface | <i>OFF</i> : disabled <i>on</i> : enabled |
| <i>tRr, FF</i> | <i>tr</i> | Selection on the tariff | <i>G 1</i> : tariff group G11 <i>G 12</i> : tariff group G12 <i>G 12w</i> : tariff group C12w <i>C 12a</i> : tariff group C12a <i>C 12b</i> : tariff group C12b <i>C 12w</i> : tariff group C12w <i>G 13</i> : tariff group G13 <i>C 22a</i> : tariff group C22a <i>C 22b</i> : tariff group C22b <i>USER</i> : User's tariff |
| | <i>H 1</i> | T1 time for tariff groups G12, G12w, C12b, C12w, USER | <i>06:00...07:00</i> or optionaly for USER |
| | <i>H 2</i> | T2 time for tariff groups G12, G12w, C12b, C12w, USER | <i>13:00...4:00</i> or optionaly for USER |
| | <i>H 3</i> | T3 time for tariff groups G12, G12w, C12b, C12w, USER | <i>15:00...6:00</i> or optionaly for USER |
| | <i>H 4</i> | T4 time for tariff groups G12, G12w, C12b, C12w, USER | <i>22:00...23:00</i> or optionaly for USER |
| | <i>rAn 1</i> | Selection of tariff for the time interval since H1 till H2. Parameter accessible only in the USER tariff group. | <i>t 1</i> : T1 zone <i>t 2</i> : T2 zone <i>t 3</i> : T3 zone <i>t 4</i> : T4 zone |
| | <i>rAn 2</i> | Selection of tariff for the time interval since H2 till H3. Parameter accessible only in the USER tariff group. | <i>t 1</i> : T1 zone <i>t 2</i> : T2 zone <i>t 3</i> : T3 zone <i>t 4</i> : T4 zone |
| | <i>rAn 3</i> | Selection of tariff for the time interval since H3 till H4. Parameter accessible only in the USER tariff group. | <i>t 1</i> : T1 zone <i>t 2</i> : T2 zone <i>t 3</i> : T3 zone <i>t 4</i> : T4 zone |
| | <i>rAn 4</i> | Selection of tariff for the time interval since H4 till H1. Parameter accessible only in the USER tariff group. | <i>t 1</i> : T1 zone <i>t 2</i> : T2 zone <i>t 3</i> : T3 zone <i>t 4</i> : T4 zone |
| | <i>Sat</i> | Selection of tariff zone for Saturdays. Parameter accessible only for the USER tariff group. The selection of "Cur" parameter, causes that the watt-hour meter counts the energy according to settings of „rAn1... 4” parameters. | <i>Cur</i> : as in the selected tariff group <i>t 1</i> : T1 zone <i>t 2</i> : T2 zone <i>t 3</i> : T3 zone <i>t 4</i> : T4 zone |
| | <i>Sun</i> | Selection of tariff zone for Sundays. Parameter accessible only for the USER tariff group. The selection of "Cur" parameter, causes that the watt-hour meter counts the energy according to settings of „rAn1... 4” parameters. | <i>Cur</i> : as in the selected tariff group <i>t 1</i> : T1 zone <i>t 2</i> : T2 zone <i>t 3</i> : T3 zone <i>t 4</i> : T4 zone |
| | <i>Hol</i> | Selection of tariff zone for Holidays. The selection of „Cur” parameter, causes that the watt-hour meter counts the energy in the zone resulting from the set tariff. | <i>Cur</i> : as in the selected tariff group <i>t 1</i> : T1 zone <i>t 2</i> : T2 zone <i>t 3</i> : T3 zone <i>t 4</i> : T4 zone |

List of configuration parameters

Table 2 (continuation)

| Main menu | Parameter symbol | Parameter description | Range of parameter changes |
|----------------|------------------|---|---|
| <i>clock</i> | <i>dy</i> | Current year | 2001...2035 |
| | <i>dn</i> | Current month | 01...12 |
| | <i>dd</i> | Current day | 01...31 |
| | <i>th</i> | Current hour | 00...23 |
| | <i>tn</i> | Current minute | 00...59 |
| | <i>Atc</i> | Automatic change of the winter/summer time | <i>off</i> : turned off <i>on</i> : turned on |
| <i>Eob</i> | <i>Eob</i> | Instant execution of the accounting period closure | <i>no</i> : no <i>yes</i> : yes |
| | <i>dd</i> | Day of automatic closure of the accounting period | 01...28 |
| | <i>th</i> | Hour of automatic closure of the accounting period | 00...23 |
| | <i>tn</i> | Minute of automatic closure of the accounting period | 00...59 |
| <i>nodebus</i> | <i>r5</i> | Working mode | <i>R8n</i> : ASCII 8N1 <i>R7E</i> : ASCII 7E1 <i>R7o</i> : ASCII 7O1 <i>r8n2</i> : RTU 8N2 <i>r8E</i> : RTU 8E1 <i>r8o</i> : RTU 8O1 <i>r8n</i> : RTU 8N1 |
| | <i>Adr</i> | Address | 1...247 |
| | <i>bd</i> | Baud rate | 4.8: 4800 bit/sec 9.6: 9600 bit/sec 19.2: 19200 bit/sec |
| <i>Clear</i> | <i>Clr</i> | Cancelation of the magnet interference and/or the cover opening | <i>no</i> : no <i>yes</i> : yes |
| <i>PowEr</i> | <i>PR</i> | Mode of power averaging | <i>15.03</i> : 15 min, subrange 3 min <i>15.05</i> : 15 min, subrange 5 min <i>15.15</i> : 15 min, subrange 15 min <i>30.06</i> : 30 min, subrange 6 min <i>30.10</i> : 30 min, subrange 10 min <i>30.30</i> : 60 min, subrange 30 min <i>60.12</i> : 60 min, subrange 12 min <i>60.20</i> : 60 min, subrange 20 min <i>60.60</i> : 60 min, subrange 60 min |

8 ENERGY MEASUREMENT

8.1 Recording of energy in tariffs

In any time, the watt-hour meter accounts the energy in one of the tariffs. When the register reaches its maximal value 999 999.9 kWh, it is automatically reset and the account begins from zero.

8.2 Recording of total energy

The recording of the total energy consists in storing the total energy consumption in one register, independently of the tariff. When the register reaches its maximal value 999 999.9 kWh, it is automatically reset and the account begins from zero.

9 POWER REGISTERS

9.1 Averaged maximal power

The measurement of maximal power can be performed in 15, 30 or 60 minutes' periods. The locking mode or the shift mode is accessible to calculate the power.

For the shift mode, one can choose 5 or 3 subperiods falling on the integration period.

For 15 minutes, there will be 3 or 5 minutes' segments, for 30 minutes, 6 or 10 minutes' segments and for 60 minutes, 12 or 20 minutes' segments. The selected number of subperiods composes the period of power integration.

After the first complete shift period including all subperiods, the next subperiod will be accounted and the first is not be taken in consideration.

The watt-hour meter stores in its memory the maximal power for the current and the previous accounting period, and the time and date of its occurrence.

9.2 Cumulated power

The cumulated power is the power register increased by the averaged value of the maximal power at the end of the accounting period.

10 END OF THE ACCOUNTING PERIOD

At the moment of the accounting period closure, values of energy from all time zones and the total energy will be memorized and at the same time, values of the accounted energy do not undergo to changes.

The automatic closure can follow automatically, on the defined day of the month and in the given time. The configuration consists on writing the minute, hour and day of the accounting period closure. The closure of the accounting period, the date and time of this operation is written.

When there is a lack of closure possibility, e.g. because of a lack of supply, the closure process will be carried out after the supply voltage recovery.

After each closure of the accounting period, it is increased by one closure counter.

Note: It is recommended to close the accounting period during the watt-hour meter installation, so as to memorize initial values of energy already counted.

If the closure has been carried out in the day in which the automatic closure should occur, then the automatic closure will be cancelled on this day.

11 AVAILABLE TARIFF GROUPS

11.1 Tariff group G11

The energy is counted during the whole time in the T1 zone.

11.2. Tariff group G12

Table 3

| Zone number | 24 hours' zone | Period of time |
|-------------|----------------------|----------------------------|
| | | (1 January - 31 December) |
| 1. | Daily zone (T1) | $H_1 - H_2$ $H_3 - H_4$ |
| 2. | Night-time zone (T2) | $H_4 - H_1$ $H_2 - H_3$ |

Notations:

$H_1: 6^{00} + 7^{00}$

$H_2: 13^{00} + 14^{00}$

$H_3: 15^{00} + 16^{00}$

$H_4: 22^{00} + 23^{00}$

Holidays are included to the zone depended on the setting of Hol parameter in tArIFF.

11.3. Tariff group G12w

Table 4

| Zone number | 24 hours' zone | Period of time |
|-------------|----------------------|----------------------------|
| | | (1 January - 31 December) |
| 1. | Daily zone (T1) | $H_1 - H_2$ $H_3 - H_4$ |
| 2. | Night-time zone (T2) | $H_4 - H_1$ $H_2 - H_3$ |

Notations:

$H_1: 6^{00} + 7^{00}$

$H_2: 13^{00} + 14^{00}$

$H_3: 15^{00} + 16^{00}$

$H_4: 22^{00} + 23^{00}$

Holidays are included in the zone depended on the setting of Hol parameter in tArIFF

Saturdays and Sundays are included In the 24 hours' zone to the second zone - night-time zone

11.4. Tariff group C13

Table 5

| Zone number | 24 hours' zone | Period of time | |
|-------------|--|---|---|
| | | Summer (1 April - 30 September) | Winter (1 October - 31 March) |
| 1. | Ante-meridian peak (T1) | $7^{00} - 13^{00}$ | $7^{00} - 13^{00}$ |
| 2. | Post-meridian peak (T2) | $19^{00} - 22^{00}$ | $16^{00} - 21^{00}$ |
| 3. | Remaining hours of the 24 hours' zone (T3) | $13^{00} - 19^{00}$ $22^{00} - 7^{00}$ | $13^{00} - 16^{00}$ $21^{00} - 7^{00}$ |

Legal day-offs, Saturdays and Sundays are included in the 24 hours' zone to the third zone, as remaining hours of the 24 hours' zone.

11.5. Tariff group C12a

Table 6

| Zone number | 24 hours' zone | Period of time | |
|-------------|---------------------|---|---|
| | | Summer (1 April - 30 September) | Winter (1 October - 31 March) |
| 1. | Peak zone (T1) | 8 ⁰⁰ - 11 ⁰⁰ 20 ⁰⁰ - 21 ⁰⁰ | 8 ⁰⁰ - 11 ⁰⁰ 17 ⁰⁰ - 21 ⁰⁰ |
| 2. | Extrapeak zone (T2) | 11 ⁰⁰ - 20 ⁰⁰ 21 ⁰⁰ - 8 ⁰⁰ | 11 ⁰⁰ - 17 ⁰⁰ 21 ⁰⁰ - 8 ⁰⁰ |

Holidays are included to the zone depended on the setting of Hol parameter in tAriFF

11.6. Tariff group C12b

Table 7

| Zone number | 24 hours' zone | Period of time | |
|-------------|----------------------|----------------------------|--|
| | | (1 January - 31 December) | |
| 1. | Daily zone (T1) | $H_1 - H_2$ $H_3 - H_4$ | |
| 2. | Night-time zone (T2) | $H_4 - H_1$ $H_2 - H_3$ | |

Notations:

H_1 : 6⁰⁰ ÷ 7⁰⁰

H_2 : 13⁰⁰ ÷ 14⁰⁰

H_3 : 15⁰⁰ ÷ 16⁰⁰

H_4 : 22⁰⁰ ÷ 23⁰⁰

Holidays are included to the zone depended on the setting of Hol parameter in tAriFF

11.7. Tariff group C12w

Table 8

| Zone number | 24 hours' zone | Period of time | |
|-------------|----------------------|----------------------------|--|
| | | (1 January - 31 December) | |
| 1. | Daily zone (T1) | $H_1 - H_2$ $H_3 - H_4$ | |
| 2. | Night-time zone (T2) | $H_4 - H_1$ $H_2 - H_3$ | |

Notations:

H_1 : 6⁰⁰ ÷ 7⁰⁰

H_2 : 13⁰⁰ ÷ 14⁰⁰

H_3 : 15⁰⁰ ÷ 16⁰⁰

H_4 : 22⁰⁰ ÷ 23⁰⁰

Saturdays and Sundays are included in the 24 hours' zone, to the second zone - night-time
Holidays are included to the zone depended on the setting of Hol parameter in tAriFF

11.8. Tariff group C22a

Table 9

| Zone number | 24 hours' zone | Period of time | | | |
|-------------|---------------------|---|---|---|---|
| | | I, II, XI, XII | III, X | IV, IX | V, VI, VII, VIII |
| 1. | Peak zone (T1) | 8 ⁰⁰ - 11 ⁰⁰ 16 ⁰⁰ - 21 ⁰⁰ | 8 ⁰⁰ - 11 ⁰⁰ 18 ⁰⁰ - 21 ⁰⁰ | 8 ⁰⁰ - 11 ⁰⁰ 19 ⁰⁰ - 21 ⁰⁰ | 8 ⁰⁰ - 11 ⁰⁰ 20 ⁰⁰ - 21 ⁰⁰ |
| 2. | Extrapeak zone (T2) | 21 ⁰⁰ - 8 ⁰⁰ 11 ⁰⁰ - 16 ⁰⁰ | 21 ⁰⁰ - 8 ⁰⁰ 11 ⁰⁰ - 18 ⁰⁰ | 21 ⁰⁰ - 8 ⁰⁰ 11 ⁰⁰ - 19 ⁰⁰ | 21 ⁰⁰ - 8 ⁰⁰ 11 ⁰⁰ - 20 ⁰⁰ |

Holidays are included to the zone depended on the setting of Hol parameter in tArIFF

11.9. Tariff group C22b

Table 10

| Zone number | 24 hours' zone | Period of time | |
|-------------|---------------------|------------------------------------|--|
| | | (1 January - 31 December) | |
| 1. | Peak zone (T1) | 6 ⁰⁰ - 21 ⁰⁰ | |
| 2. | Extrapeak zone (T2) | 21 ⁰⁰ - 6 ⁰⁰ | |

Holidays are included to the zone depended on the setting of Hol parameter in tArIFF

11.10. Liste of holidays

Following days are implemented in the watt-hour meter, as permanent holidays:

| | | |
|---------------------------|---------------|--|
| statutorily free of work: | 1st January | - New Year, |
| | 1st May | - International Holiday of the 1st of May, |
| | 3rd May | - National Holiday of 3rd May, |
| | 15th August | - Assumption, |
| | 1st November | - All Saints Day, |
| | 11st November | - Independence Day, |
| | 25th December | - First Day of Christmas, |
| | 26th December | - Second Day of Christmas. |

Movable feasts: The first day of Easter, Corpus Christi.

12 OPTICAL INTERFACE

Parameter set of the optical link of the LS1.1 watt-hour meter:

| | |
|-------------------------------------|---------------------------------|
| - conformity with the standard | EN62056-21 |
| - manufacturer identifier | LML |
| - baud rate identifier | 4 |
| - watt-hour meter identifier | LS11-LUMEL |
| - transmission protocol | mode C of transmission |
| - transmission initialization | 300 baud |
| - available baud rates | 300, 600, 1200, 2400, 4800 baud |
| - character format acc. to ISO 1177 | 7E1 |
| - write interlock | button secured by a leaden seal |

The optical interface in the watt-hour meter enables the realization of following functions:

- data readout from the watt-hour meter,
- write of selected parameters to the watt-hour meter,
- closure of the accounting period.

The write of parameters and closure of the current accounting period are possible after breaking the leaden seal and setting the button on the SET position.

To unlock or lock the write, one must:

- press the SET button in a time longer than 2 sec,
- pressing the SET button, transit to the „*oPĘ*,” menu,
- by means of the SCROLL button unlock the „*SEt on*” write or lock the „*SEt oFF*” write,
- pressing the SET button in a time longer than 2 sec, accept the change,
- pressing the SET button, exit from the SETUP procedure.

The locking of the write follows automatically after a 5 minutes' lack of communication through the optical link.

12.1 Watt-hour meter registers in the readout mode

The list of registers with identifiers and the example of contents in case of data readout is presented in the tables below.

Note: Depending on the option and watt-hour meter configurations, the number of available registers for readout can be smaller.

Table 11

| Identifier (ASCII charac- ters) | Format of ASCII charac- ters (example of contents) | Parameter |
|--|---|--|
| 28 | 12:34:56 | Current time |
| 29 | 25-11-02 | Current date (dd:mm:yy) |
| 0.0 | AbcDeFgHiJ | User's identifier |
| 0.0.1 | 02110001 | Factory number |
| 0.8.1 | 000123.4*kWh | Energy in zone 1 |
| 0.8.2 | 000423.4*kWh | Energy in zone 2 |
| 0.8.3 | 000623.4*kWh | Energy in zone 3 |
| 0.8.4 | 000723.4*kWh | Energy in zone 4 |
| 0.8.0 | 001323.4*kWh | Total energy from all zones |
| 0.6.0 | 10:23 20-11-02; 99.2*kW | Time and date of the maximal 15', 30' or 60' power occurrence and its value. |
| 70. | 10:23 20-11-02 | Time and date of the account period closure. |
| 0.8.1*00 | 000123.4*kWh | Energy in zone 1 at the end of the previous account period. |
| 0.8.2*00 | 000423.4*kWh | Energy in zone 2 at the end of the previous account period. |
| 0.8.3*00 | 000623.4*kWh | Energy in zone 3 at the end of the previous account period. |
| 0.8.4*00 | 000723.4*kWh | Energy in zone 4 at the end of the previous account period |
| 0.8.0*00 | 001323.4*kWh | Total energy at the end of the previous account period. |
| 0.6.0*00 | 10:23 19-11-02; 90.2*kW | Time and date of the max. 15', 30' or 60' power occurrence in the previous account period and its value. |
| 0.6 | 6344.7*kW | Cumulated power (max. „65535”) |
| 0.1. | 22352 | Counter of account period closures (max. „65535”) |

Table 11 (continuation)

| Identifier (ASCII charac- ters) | Format of ASCII charac- ters (example of contents) | Parameter |
|--|---|--|
| 54. | 010301 | <p>Watt-hour meter status:</p> <p>1 st character - Signalling of voltage in the phase ('0' - $U < 0.9 \text{ Un}$; '1' - $U \geq 0.9 \text{ Un}$)</p> <p>2 nd character - Always '0'</p> <p>3 rd character - Always '0'</p> <p>4 th character - Current time zone:</p> <ul style="list-style-type: none"> '1' - 1 st zone T1 '2' - 2 nd zone T2 '3' - 3 nd zone T3 '4' - 4 th zone T4 <p>5 th character - Signalling of cover opening ('0' or '1')</p> <p>6 th character - Signalling of magnetic field interference ('0' or '1')</p> |
| FF | 01101000 00011000 | Register of watt-hour meter errors (see table 12) ('0' or '1') |
| 0.43 | 7 | <p>Time of power averaging and number of subperiods:</p> <ul style="list-style-type: none"> '0' - 15 min, 3 min'subperiod '1' - 15 min, 5 min'subperiod '2' - 15 min, 15 min'subperiod '3' - 30 min, 6 min'subperiod '4' - 30 min, 10 min'subperiod '5' - 30 min, 30 min'subperiod '6' - 60 min, 12 min'subperiod '7' - 60 min, 20 min'subperiod '8' - 60 min, 60 min'subperiod |
| 50. | 17;13:55 | <p>Day and time in which the account period is closed. (day '00' - automatic closure is off; day '01'...'28'; hour '00'...'23' : minute '00'...'59')</p> |
| 51. | 05 | <p>Tariff groups:</p> <ul style="list-style-type: none"> '00' - G11 '01' - G12 '02' - G12w '03' - C12a '04' - C12b '05' - C12w '06' - G13 '07' - C22a '08' - C22b '09' - USEr (user's tariff) '10' - controlled by the external clock |
| 51.1 | 07:20; 10:12; 22:30; 23:30 | Variable hours for tariffs: G12, G12w, C12b, C12w, USEr |

Table 11 (continuation)

| | | |
|------|-----------------|---|
| 51.2 | 1010114 | Time zones for Saturdays, Sundays and holidays (only for USEr tariff) 1st character - zone for hour interval since H1 till H2 2nd character - zone for the hour interval since H2 till H3 3rd character - zone for the hour interval since H3 till H4 4th character - zone for the hour interval since H4 till H1 |
| | | Meaning of 1...4 characters: '0' - T1 zone '1' - T2 zone '2' - T3 zone '3' - T4 zone |
| | | 5th character - Zone for Saturdays (only for USEr tariff) 6th character - Zone for Sundays (only for USEr tariff) 7th character - Zone for holidays |
| | | Meaning of 5...7 characters: '0' - as in the selected tariff group '1' - T1 zone '2' - T2 zone '3' - T3 zone '4' - T4 zone |
| | | In case when choosing '0', time zones are defined acc. to the chosen tariff group (see the description of tariff zones in Table 2.) |
| 52. | 22112 | Configuration of the serial link (mode, address, baud rate): 1st character - mode '1' - ASCII 8N1 '2' - ASCII 7E1 '3' - ASCII 7O1 '4' - RTU 8N2 '5' - RTU 8E1 '6' - RTU 8O1 '7' - RTU 8N1 2, 3, 4th character - address („001”...“247”) 5th character - baud rate '0' - 4800 baud '1' - 9600 baud '2' - 19200 baud |
| 53. | 6.4 | No of the program version |
| 55. | 1 | Automatic change of winter time/summer time '0' - off '1' - on |
| 76.1 | 10:12 25-11-05; | Hour and date of the beginning of interference by a strong magnetic field |
| 76.2 | 0000000327 | Duration of interference by a strong magnetic field [sec] |
| 77. | 0 | Index of cover opening (interference into the watt-hour meter) '0' - There was no opening '1' - There was or/there is an opening |
| 78 | 00003 | Number of register erasing of interference by a strong magnetic field and/or housing opening. |

Description of the register - watt-hour meter errors

Table 12

| Character number | Description |
|------------------|--|
| 0 | Detection of erroneous contents - energy in zone T1 |
| 1 | Detection of erroneous contents - energy in zone T2 |
| 2 | Detection of erroneous contents - energy in zone T3 |
| 3 | Detection of erroneous contents - energy in zone T4 |
| 4 | Detection of erroneous contents - total energy |
| 5 | Detection of erroneous contents - energy in zone T1 in the previous account period |
| 6 | Detection of erroneous contents - energy in zone T1 in the previous account period |
| 7 | Detection of erroneous contents - energy in zone T2 in the previous account period |
| 8 | Detection of erroneous contents - energy in zone T3 in the previous account period |
| 9 | Detection of erroneous contents - total energy in the previous account period |
| 10-14 | Not used |
| 15 | Incorrect value of the error register. |

12.2 Watt-hour meter registers in the programming and read-out mode

List of watt-hour meter registers with identifiers and example of contents in case of readout and/or data write in the programming mode.

Table 13

| Identifier (ASCII characters) | Format of ASCII characters (example of contents) | Parameter | Functions |
|-------------------------------|--|---|-----------|
| T | 12:34:56 25-11-02 | Current time and date | R/W |
| A | 1 | Automatic time change winter/summer acc. to fig.10c | R/W |
| I | AbcDeFgHiJ | User's identifier | R/W |
| N | 02110001 | Factory number | R |
| D | 7 | Power averaging time and number of subperiods: (like in table 11) | R/W |
| E | 17;13:55 | Day and time in which the account period is closed. (day „00”... „28”) | R/W |
| G | 05 | Kind of tariff group (like in table 11) | R/W |
| H | 07:20; 10:12 22:30; 23:30 | Variable hours for tariffs: G12, G12w, C12b, C12w, USER | R/W |
| C | 22112 | Configuration of the serial link (mode, address, baud rate) (like in table 11) | R/W |
| R | 1 | Register erasing of interference by a strong magnetic field and cover opening. | R/W |

Table 13 (continuation)

| | | | |
|---|---------|---|-----|
| Z | 1010111 | <p>Selection of the time zone for tariff hours, Saturdays, Sundays and holidays (only for USEr tariff).</p> <p>1 st character – selection of zone for the hour interval since H1 till H2 2 nd character – selection of zone for the hour interval since H2 till H3 3 rd character – selection of zone for the hour interval since H3 till H4 4 th character – selection of zone for the hour interval since H4 till H1</p> <p>Meaning of 1...4 characters:</p> <ul style="list-style-type: none"> '0' - T1 zone '1' - T2 zone '2' - T3 zone '3' - T4 zone <p>5 th character - selection of zone for Saturdays (only for USEr tariff) 6 th character - selection of zone for Sundays (only for USEr tariff) 7 th character - selection of zone for holidays</p> <p>Meaning of 5...7 characters:</p> <ul style="list-style-type: none"> '0' - as for the selected tariff group '1' - T1 zone '2' - T2 zone '3' - T3 zone '4' - T4 zone <p>In case when '0' is chosen, time zones are defined acc. to the selected tariff group (see the description of the tariff zones in Table 2)</p> | R/W |
|---|---------|---|-----|

Notations: R - only for readout

R/W - readout and write

Note: In case of a watt-hour meter configuration, when the given parameter is not used, the character code '-' (minus) is returned.

13. RS-485 or RS-232 SERIAL INTERFACE WITH MODBUS PROTOCOL

13.1 Set of serial interface parameters:

- identifier 0xA0
 - watt-hour meter address 1... 247
 - baud rate 4800, 9600, 19200 bódów,
 - working mode ASCII, RTU,
 - information unit ASCII: 8N1, 7E1, 7O1;
RTU: 8N2, 8E1, 8O1, 8N1,
 - maximal response time 600 ms.

Factory settings: address: 1, baud rate: 9600 baud, RTU mode: 8N2.

LS1.1. watt-hour meter realizes following protocol functions:

Table 14

| Code | Meaning |
|------|------------------------------------|
| 03 | Readout of n-registers |
| 17 | Identification of the slave device |

13.2 Map of watt-hour meter registers

Data are placed in 16-bit registers. Process variables and watt-hour meter parameters are placed in the register address space in a way depending on the type of the variable value.

Bits in the 16-bit registers are numbered from the youngest to the oldest (b0-b15).

Table of watt-hour meter 16-bit registers

Table 15

| Register number | Parameter | Range | Description |
|-----------------|-----------|---------------|---|
| 4000 | word | 0... 65535 | Watt-hour meter status ← description in table 16. |
| 4001 | word | 2001... 2035 | Current year |
| 4002 | word | 101... 1231 | Current date in format: month * 100 + day |
| 4003 | word | 0... 2359 | Current time in format: hour * 100 + minute |
| 4004 | MS word | 05010001... | Serial number |
| 4005 | LS word | 35129999 | |
| 4006 | word | 0x00... 0xEE | User's identifier (1 and 2 character) |
| 4007 | word | 0x00... 0xEE | User's identifier (3 and 4 character) |
| 4008 | word | 0x00... 0xEE | User's identifier (5 and 6 character) |
| 4009 | word | 0x00... 0xEE | User's identifier (7 and 8 character) |
| 4010 | word | 0x00... 0xEE | User's identifier (9 and 10 character) |
| 4011 | MS word | 0... 99999999 | Active energy in zone T1 (kWhx100) |
| 4012 | LS word | | |
| 4013 | MS word | 0... 99999999 | Active energy in zone T2 (kWhx100) |
| 4014 | LS word | | |
| 4015 | MS word | 0... 99999999 | Active energy in zone T3 (kWhx100) |
| 4016 | LS word | | |
| 4017 | MS word | 0... 99999999 | Active energy in zone T4 (kWhx100) |
| 4018 | LS word | | |
| 4019 | MS word | 0... 99999999 | Total active energy |
| 4020 | LS word | | |
| 4021 | MS word | | Reserved |
| 4022 | LS word | | |
| 4023 | MS word | | Reserved |
| 4024 | LS word | | |
| 4025 | MS word | | Reserved |
| 4026 | LS word | | |
| 4027 | MS word | 0... 99999999 | Active energy in zone T1 at the end of the previous accounting period (kWhx100) |
| 4028 | LS word | | |

Table of watt-hour meter 16-bit registers

Table 15 (continuation)

| | | | |
|------|---------|---------------|---|
| 4029 | MS word | 0... 99999999 | Active energy in zone T2 at the end of the previous accounting period (kWhx100) |
| 4030 | LS word | | |
| 4031 | MS word | 0... 99999999 | Active energy in zone T3 at the end of the previous accounting period (kWhx100) |
| 4032 | LS word | | |
| 4033 | MS word | 0... 99999999 | Active energy in zone T4 at the end of the previous accounting period (kWhx100) |
| 4034 | LS word | | |
| 4035 | MS word | 0... 99999999 | Total active energy at the end of the previous accounting period (kWhx100) |
| 4036 | LS word | | |
| 4037 | word | 0... 65535 | Counter of accounting period closures |
| 4038 | word | 2001... 2035 | Year of accounting energy closure |
| 4039 | word | 101... 1231 | Date of accounting period closure in format: month * 100 + day |
| 4040 | word | 0... 2359 | Time of accounting period closure in format: hour * 100 + minute |
| 4041 | word | 0... 700 | The highest value of averaged power (kWh x10) |
| 4042 | word | 2001... 2035 | Year of the highest value of averaged power occurrence |
| 4043 | word | 101... 1231 | Date of the highest value of averaged power occurrence in format: month * 100 + day |
| 4044 | word | 0... 2359 | Time of the highest value of averaged power occurrence in format: hour * 100 + minute |
| 4045 | word | 0... 455 | The highest value of averaged power in the previous accounting period. |
| 4046 | word | 2001... 2035 | The year of the highest value of averaged power occurrence in the previous accounting period |
| 4047 | word | 101... 1231 | The date of the highest value of averaged power in the previous accounting period in format: month * 100 + day |
| 4048 | word | 0... 2359 | The time of the highest value of averaged power in the previous accounting period in format: hour * 100 + minute |
| 4049 | word | 0... 65535 | Cumulated power (kW x 10) |

Table of watt-hour meter 16-bit registers

Table 15 (continuation)

| | | | |
|------|---------|---------------------------|---|
| 4050 | word | 0... 8 | Way of power averaging 0 - 15 min, 3 min'subperiod 1 - 15 min, 5 min'subperiod 2 - 15 min, 15 min'subperiod 3 - 30 min, 6 min'subperiod 4 - 30 min, 10 min'subperiod 5 - 30 min, 30 min'subperiod 6 - 60 min, 12 min'subperiod 7 - 60 min, 20 min'subperiod 8 - 60 min, 60 min'subperiod |
| 4051 | word | 0... 2359 | Time of the automatic accounting period closure in format: hour * 100 + minute |
| 4052 | word | 0... 28 | Day of the automatic accounting period closure |
| 4053 | word | 0... 32000 | Constant of pulse output: (imp/kWh) |
| 4054 | word | 0... 10 | Tariff group: 0 - G11 1 - G12 2 - G12w 3 - C12a 4 - C12b 5 - C12w 6 - G13 7 - C22a 8 - C22b 9 - USEr (user's tariff) 10 - external clock control |
| 4055 | word | 10... X | Number of the program version (x10) |
| 4056 | word | 0... 65535 | Register of watt-hour meter errors ← description in table 17. |
| 4057 | word | 2001... 2035 | Year of the first beginning of interference by a strong magnetic field |
| 4058 | word | 101... 1231 | Month and day of the first beginning of interference by a strong magnetic field |
| 4059 | word | 0... 2359 | Time of the first beginning of interference by a strong magnetic field |
| 4060 | MS word | 0... (2 ³² -1) | Duration of interference by a strong magnetic field |
| 4061 | LS word | | |
| 4062 | word | 0... 1 | Index of cover opening (interference in the watt-hour meter) |
| 4063 | word | 0... 65535 | Number of erasings of interference by a strong magnetic field and/or the index of cover opening |

Meaning of bits in the Status register (register 4000)

Table 16

| Bit | Description |
|---------|---|
| 0 | Signalling of voltage in phase 0 - voltage under 0,9 Un 1 - voltage over 0,9 Un |
| 1 | Always 0 |
| 2 | Always 0 |
| 3 - 5 | Current time zone Bits: 5 4 3 0 0 1 - T1 zone 0 1 0 - T2 zone 0 1 1 - T3 zone 1 0 0 - T4 zone |
| 6 - 7 | Decimal places for power Bits: 7 6 0 0 - without decimal places 0 1 - 1 decimal place 1 0 - 2 decimal places |
| 8 - 9 | Decimal places for energy Bits: 9 8 0 0 - without decimal places 0 1 - 1 decimal place 1 0 - 2 decimal places |
| 10 - 11 | Prefix of the unit for energy and power Bits: 11 10 0 0 - lack 0 1 - k 1 0 - M |
| 12 | Interference by a strong magnetic field 0 - lack 1 - exist |
| 13 | Opening of the watt-hour meter cover 0 - cover closed 1 - cover open |
| 14 | Not used |
| 15 | Error 0 - no errors 0 - one must check the error register |

Meaning of bits in the error register (register 4046)

Table 17

| Bit | Description |
|---------|--|
| 0 | Detection of an erroneous contents - energy in zone T1 |
| 1 | Detection of an erroneous contents - energy in zone T2 |
| 2 | Detection of an erroneous contents - energy in zone T3 |
| 3 | Detection of an erroneous contents - energy in zone T4 |
| 4 | Detection of an erroneous contents - total energy |
| 5 | Detection of an erroneous contents - energy in zone T1 in the previous accounting period |
| 6 | Detection of an erroneous contents - energy in zone T2 in the previous accounting period |
| 7 | Detection of an erroneous contents - energy in zone T3 in the previous accounting period |
| 8 | Detection of an erroneous contents - energy in zone T4 in the previous accounting period |
| 9 | Detection of an erroneous contents - total energy in the previous accounting period |
| 10 - 14 | Not used |
| 15 | Incorrect value of the error register |

14. INTERNAL CONTROL CLOCK (OPTION)

The LS1.1. watt-hour meter has an astronomical time clock supported by a battery. The current time is counted in the 24-hour' format.

This clock is used for the time zone switching. The clock has the function of the automatic change from the winter time into the summer time and inversely. The transition from the winter time into the summer time is carried out in the night from Saturday to Sunday, on the last Sunday of March the clock is being transposed from 2:00 to 3:00 o'clock. The transition from the summer time into the winter time is carried out in the night from Saturday to Sunday, on the last Sunday of October the clock is being transposed from 3:00 to 2:00 o'clock. If the user set the current time between 2:00 and 3:00, on the last Sunday of October, the clock assumes the summer time.

15. TECHNICAL DATA

| | |
|--|--------------------------|
| Kind of network | 2 - wire |
| Connection way of the watt-hour meter | direct |
| Reference voltage U_n | acc. to the version code |
| Basic current I_b | acc. to the version code |
| Maximal current I_{max} | acc. to the version code |
| Accuracy class | acc. to the version code |

| | |
|--|--|
| Working temperature range | - 35... 65°C |
| Storage ambient temperature | - 35... 80°C |
| Power consumption: | |
| - in the voltage circuit | ≤ 8 VA/0.3 W |
| - in the voltage circuit for a watt-hour meter with RS-485, RS-232 interface or a radio module | ≤ 7 VA/1.3 W |
| - in the current circuit | ≤ 0.015 VA |
| Starting current | 0,004 I _b |
| Detection level of the voltage presence | 0,90 U _n |
| Pulse constant of the LED diode | 3200 imp./kWh or another (to agree) |
| Readout field | special LCD display |
| Communication interfaces | acc. to the version code |
| Output of energy pulses | output of O.C. type, passive acc. to EN 62053-31 |
| Pulse constant of O.C. output | 3200 imp./kWh or another (to agree) |
| Tariff input | 1 input (2 tariffs), switched voltage U _n |
| Available tariffs | G11, G12, G12w, G13, C12a, C12b, C12w, C22a, C22b, 1 tariff programmed by the user |
| Number of tariff zones | from 1 to 4 |
| Resistance against external permanent magnetic field | 640 kA/m |
| Resistance against surge voltages | 4 kV |
| Reaction of the watt-hour meter to voltage decays | Storage of data and the watt-hour meter state after the decay in the FRAM non-volatile memory, storage durability: min. 15 years |
| Clock accuracy | ± 2s/day |
| Protection degree ensured by the housing | IP 54 |
| Battery life time | minimum 10 years |
| External dimensions (H × W × D) | 203 × 122 × 65 mm |
| Weight | ca. 0,75 kg |

16. ORDER CODES

Table 18

| Electronic single-phase watt-hour meter - LS1.1 | X | X | XX | X | X | X |
|---|---|---|----|----|---|---|
| Basic and maximal current: | | | | | | |
| 5 (40) A | | | | 1 | | |
| 5 (60) A | | | | 2 | | |
| 10 (40) A | | | | 4 | | |
| 10 (60) A | | | | 5 | | |
| as per order ¹⁾ | | | | X | | |
| Input voltage: | | | | | | |
| 230 V | | | | 1 | | |
| as per order ¹⁾ | | | | X | | |
| Communication interface: | | | | | | |
| optical port | | | | 00 | | |
| optical port + pulse output (open collector) | | | | 01 | | |
| optical port + output of RS-485 type (Modbus) | | | | 02 | | |
| optical port + output of RS-232 type (Modbus) | | | | 04 | | |
| without optical port and interfaces ³⁾ | | | | 05 | | |
| optical port + radio module ¹⁾ | | | | 20 | | |
| as per order ¹⁾ | | | | XX | | |
| Accuracy class: | | | | | | |
| accuracy clas 1 | | | | 1 | | |
| accuracy clas 2 | | | | 2 | | |
| Tariffs: | | | | | | |
| single-tariff without internal clock | | | | 1 | | |
| single or multi-tariff with internal clock | | | | 2 | | |
| two-tariff with external clock ¹⁽²⁾ | | | | 3 | | |
| Acceptance tests: | | | | | | |
| without legalization | | | | 8 | | |
| with legalization | | | | 7 | | |
| acc. to user's agreements ¹⁾ | | | | X | | |

¹⁾ - Custom-made version, one must agree with the manufacturer

²⁾ - Concerns only the version LS1-1 X X 00 X XX (optical port)

³⁾ - Concerns only the 1-tariff version with internal clock of LS1.1 - X X XX X 1X

CODING EXAMPLE:

The code: **LS1.1 2 1 01 1 1 8** means:

LS1.1 - Electronic single-phase watt-hour meter with LCD display

2 - Basic and maximal current: 5 (60) A

1 - Input voltage: 230 V

01 - Communication interface: optical port and output of O/C type

1 - Accuracy class: 1

1 - Single tariff version

8 - Delivered without a legalization certificate

17. MAINTENANCE AND WARRANTY

The LS1.1 watt-hour meter does not require any periodical maintenance. In case of some incorrect operations:

1. After the dispatch date and within the period stated in the warranty card

One should return the watt-hour meter to the Quality Inspection Dept.

If the instrument has been used in compliance with the instructions, we warrant to repair it free of charge.

The disassembling of the housing causes the cancellation of the granted warranty.

2. After the warranty period:

One should send the instrument to repair it in an authorized service workshop.

Spare parts are available for the period of five years from the date of purchase.

Our policy is one of continuous improvement and we reserve the right to make changes in design and specifications of any products as engineering advances or necessity requires and revise the above specifications without notice.

SALES PROGRAM

- DIGITAL and BARGRAPH PANEL METERS
- MEASURING TRANSDUCERS
- ANALOG PANEL METERS (DIN INSTRUMENTS)
- ANALOG and DIGITAL CLAMP-ON METERS
- INDUSTRIAL and HOUSEHOLD CONTROLLERS
- CHART AND PAPERLESS RECORDERS
- POWER CONTROL UNITS and INVERTERS
- LARGE SIZE NUMERIC and ALPHANUMERIC DISPLAYS
- AUTOMOTIVE DASHBOARD INDICATORS
- ACCESSORIES FOR MEASURING INSTRUMENTS
- MEASURING SYSTEMS (ENERGY, HEAT, CONTROL)
- CUSTOM-MADE PRODUCTS

**MEASUREMENT
CONTROL
RECORDING**

WE ALSO OFFER OUR SERVICES IN THE PRODUCTION OF:

- ALUMINIUM ALLOY PRESSURE CASTINGS
- PRECISION ENGINEERING AND THERMOPLASTICS PARTS
- PRESSURE CASTING DIES AND OTHER TOOLS

QUALITY PROCEDURES

ACCORDING TO ISO 9001 AND ISO 14001 INTERNATIONAL REQUIREMENTS.

All our instruments have CE mark and respect RoHs Directives.

For more information, please write to or phone our Export Department

LS1.1-07A



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